GEORGIA INSTITUTE OF TECHNOLOGY

OFFICE OF RESEARCH ADMINISTRATION

Date: 2 July 1968

RESEARCH PROJECT INITIATION

Project Title: A Study of Solid Surfaces

Project No.: B-1502 (G-33-602)

Project Director: Dr. Bruce W. Davis

Sponsor: Petroleum Research Fund, American Chemical Society

Agreement Period: From 1 September 1968 until 31 August 1971

Type Agreement: Grant PRF #3664-A3,5

Amount: $10,080 for the period 1 September 1968 to 31 August 1969
8,160 for the period 1 September 1969 to 31 August 1970
5,760 for the period 1 September 1970 to 31 August 1971
$24,000 Total Budget

Grant Administrator

Dr. Robert E. Henze, Director
Research Grants and Fellowships Division
The Petroleum Research Fund
American Chemical Society
1155 Sixteenth Street, N. W.
Washington, D. C. 20036

Reports Required

Annual Progress - approximately 31 August each year.

Final - upon completion of project.

Assigned to: School of Chemistry

COPIES TO:

- [X] Project Director
- [X] School Director
- [X] Dean of the College
- [X] Administrator of Research
- [X] Associate Controller (2)
- [X] Security-Reports-Property Office
- [X] Patent Coordinator
- [X] Library
- [X] Rich Electronic Computer Center
- [X] Photographic Laboratory
- [ ] EES Machine Shop
- [ ] EES Accounting Office

Other Mr. R. A. Martin EES
File B-1502

RA-3 (4/65)

M-6028

GEORGIA INSTITUTE OF TECHNOLOGY

OFFICE OF RESEARCH ADMINISTRATION

RESEARCH PROJECT TERMINATION

Date: April 3, 1972

Project Title: A Study of Solid Surfaces

Project No: G-33-602 (B-1502)

Principal Investigator: Dr. B. W. Davis

Sponsor: American Chemical Society

Effective Termination Date: April 1, 1972

Clearance of Accounting Charges: Charges should clear by May 31, 1972

Grant/Contract Closeout Actions Remaining:

1. Financial Report
2. Confirmation of Final Technical Report

Assigned to: School of Chemistry

COPIES TO:

- Principal Investigator
- School Director
- Dean of the College
- Director, Research Administration
- Director, Financial Affairs (2)
- Security-Reports-Property Office
- Patent and Inventions Coordinator
- ~~Library~~, Technical Reports Section
- Rich Electronic Computer Center
- Photographic Laboratory
- Project File
- Other _____

RA-4 (6-71)

B. FINAL REPORT

file G-33-602

PRF # 3664-A3.5

TITLE OF GRANT A Study of Solid Surfaces

PRINCIPAL INVESTIGATOR Bruce W. Davis

INSTITUTION Georgia Institute of Technology

Crystalline, stoichiometric TiC was prepared from Sterling FT graphitized carbon and hydrided titanium metal.[1] X-ray crystallographic studies yielded a lattice constant for this material of 4.3268 ± 0.0006 Å. Total impurities amounted to about 1.2 wt. % as determined by X-ray emission electron microprobe analysis. TiC particles retain morphological characteristics identical to those of polyhedral graphitized carbon. An average particle size obtained from electron micrographs indicates an increase in diameter comparable to that predicted from the known change in molar volume. Comparison of the nitrogen area of 6.9 m^2/g with the microscopy area of $4.4 \pm .5$ m^2/g implies that internal surface area has been created during synthesis.

Multilayer adsorption isotherms for Ar, N_2 and CH_4 at 77^oK[1,2] do not show the stepped behavior characteristic of cooperative layer filling on monoenergetic graphite. Careful measurements have revealed that minor "humps" do however occur in the multilayer regions for Ar and CH_4, suggesting that the surface is composed of more than one type of surface.

Extensive submonolayer adsorption measurements with Ar and C_6H_6 at several temperatures have permitted determination of heats of adsorption and site energy distribution analyses. The site energy distribution function for Ar (assuming a Fowler-Guggenheim local isotherm) reveals four sharp peaks. The site energy distribution function for C_6H_6 (assuming a Langmuir local isotherm) is quite similar, having three peaks and a hump which is apparently an unresolved peak. It may therefore be concluded that the TiC surface is composed primarily of four distinct crystal faces.

References

1. Davis, B. W. and Varsanik, R. G., J. Colloid and Interface Sci. 37, 870 (1971).

2. Varsanik, R. G., "Physical Adsorption on Crystalline Titanium Carbide," (Ph.D. Thesis, School of Chemistry, Georgia Institute of Technology, June 1972).